

What is claimed is:

1. A super twist nematic (STN) liquid crystal display (LCD) driver which drives a STN LCD panel, the STN LCD driver comprising:

a reference voltage generating unit which generates a reference voltage in response to an external voltage;

a voltage boosting unit which generates a boosting voltage by boosting the external voltage;

a voltage control unit which generates a first segment voltage and a second segment voltage which drive a segment electrode of the STN LCD panel in response to the reference voltage and the boosting voltage;

a first common voltage generating unit which drives a common voltage of the STN LCD panel in response to the external voltage, a ground voltage, and the first segment voltage and generates a first common voltage, the voltage level of which is higher than the voltage level of the first segment voltage, using a predetermined resistance ratio; and

a second common voltage generating unit which drives a common voltage of the STN LCD panel in response to the external voltage, the ground voltage, and the first segment voltage and generates a second common voltage, the voltage level of which is lower than the voltage level of the first segment voltage, using a predetermined resistance ratio.

2. The STN LCD driver of claim 1, wherein the voltage boosting unit includes a boosting circuit, which has a charge capacitor, and receives and boosts the external voltage.

3. The STN LCD driver of claim 1, wherein the first common voltage generating unit comprises:

a common boosting circuit which generates the first common voltage in response to the external voltage and the ground voltage; and

a boosting comparing circuit which turns off the common boosting circuit if the voltage level of a first common division voltage is higher than the voltage level of the

first segment voltage and turns on the common boosting circuit if the voltage level of the first common division voltage is lower than the voltage level of the first segment voltage, wherein the voltage level of the first common division voltage is generated by dividing the voltage level of the first common voltage using a predetermined resistance ratio.

4. The STN LCD driver of claim 3, wherein the boosting comparing circuit comprises:

a boosting comparator which has a negative input end connected to the first segment voltage, a positive input end connected to the first common division voltage, and an output end that turns on or off the common boosting circuit;

a boosting adjustable resistance which is connected between an output end of the common boosting circuit and the positive input end of the boosting comparator; and

a boosting resistance which is connected between the positive input end of the boosting comparator and the ground voltage.

5. The STN LCD driver of claim 3, wherein the common boosting circuit includes a charge capacitor therein.

6. The STN LCD driver of claim 1, wherein the second common voltage generating unit comprises:

a common dropping circuit which generates the second common voltage in response to the external voltage and the ground voltage; and

a dropping comparing circuit which turns on the common dropping circuit if the voltage level of a second common division voltage is higher than the voltage level of the first segment voltage and turns off the common dropping circuit if the voltage level of the second common division voltage is lower than the voltage level of the first segment voltage,

wherein the voltage level of the second common division voltage is generated by dividing the voltage level of the second common voltage using a predetermined resistance ratio.

7. The STN LCD driver of claim 6, wherein the dropping comparing circuit comprises:

a dropping comparator which has a negative input end connected to the first segment voltage, a positive input end connected to the second common division voltage, and an output end that turns on or off the common dropping circuit;

a dropping adjustable resistance which is connected between an output end of the common dropping circuit and the positive input end of the dropping comparator; and

a dropping resistance which is connected between the positive input end of the dropping comparator and the second segment voltage.

8. The STN LCD driver of claim 6, wherein the common dropping circuit includes a charge capacitor therein.

9. A super twist nematic (STN) liquid crystal display (LCD) driver which drives an STN LCD panel, the STN LCD driver comprising:

a reference voltage generating unit which generates a reference voltage in response to an external voltage;

a first segment voltage generating unit which receives the reference voltage in response to the external voltage and generates a first segment voltage which drives a segment electrode of the STN LCD panel;

a second segment voltage generating unit which generates a second segment voltage by boosting the first segment voltage;

a first common voltage generating unit which drives a common electrode of the STN LCD panel in response to the external voltage, the ground voltage, and the first segment voltage and generates a first common voltage, the voltage level of which is higher than the voltage level of the first segment voltage, using a predetermined resistance ratio; and

a second common voltage generating unit which drives a common electrode of the STN LCD panel in response to the external voltage, the ground voltage, and the first segment voltage and generates a second common voltage, the voltage level of which is higher than the voltage level of the first segment voltage, using a predetermined resistance ratio.

10. The STN LCD driver of claim 9, wherein the second segment voltage generating unit comprises a boosting circuit, which has a charge capacitor, and receives and boosts the first segment voltage.

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11. The STN LCD driver of claim 9, wherein the second segment voltage generating unit further comprises a segment voltage comparing circuit which turns off the boosting circuit if the voltage level of a segment division voltage is higher than the voltage level of the first segment voltage and turns on the boosting circuit if the voltage level of the segment division voltage is lower than the voltage level of the first segment voltage,

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wherein the voltage level of the segment division level is generated by dividing the voltage level of the second segment voltage using a predetermined resistance ratio.

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12. The STN LCD driver of claim 11, wherein the segment voltage comparing circuit further comprises:

a segment voltage comparator which has a negative input end connected to the first segment voltage, a positive input end connected to the segment division voltage, and an output end that turns on or off the boosting circuit;

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a first segment resistance which is connected between an output end of the boosting circuit and the positive input end of the segment voltage comparator; and

a second segment resistance which is connected between the positive input end of the segment voltage comparator and the ground voltage.

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13. The STN LCD driver of claim 9, wherein the first common voltage generating unit further comprises:

a common boosting circuit which generates the first common voltage in response to the external voltage and the ground voltage; and

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a boosting comparing circuit which turns off the common boosting circuit if the voltage level of a first common division voltage is higher than the voltage level of the first segment voltage and turns on the common boosting circuit if the voltage level of the first common division voltage is lower than the voltage level of the first segment voltage,

wherein the voltage level of the first common division voltage is generated by dividing the voltage level of the first common voltage using a predetermined resistance ratio.

5           14.       The STN LCD driver of claim 13, wherein the boosting comparing circuit comprises:

          a boosting comparator which has a negative input end connected to the first segment voltage, a positive input end connected to the first common division voltage, and an output end that turns on or off the common boosting circuit;

10           a boosting adjustable resistance which is connected between an output end of the common boosting circuit and the positive input end of the boosting comparator; and

          a boosting resistance which is connected between the positive input end of the boosting comparator and the ground voltage.

15           15.       The STN LCD driver of claim 13, wherein the common boosting circuit includes a charge capacitor therein.

          16.       The STN LCD driver of claim 9, wherein the second common voltage generating unit comprises:

20           a common dropping circuit which generates the second common voltage in response to the external voltage and the ground voltage; and

          a dropping comparing circuit which turns on the common dropping circuit if the voltage level of a second common division voltage is higher than the voltage level of the first segment voltage and turns off the common boosting circuit if the voltage level of the second common division voltage is lower than the voltage level of the first segment voltage,

25           wherein the voltage level of the second common division voltage is generated by dividing the voltage level of the second common voltage using a predetermined resistance ratio.

30           17.       The STN LCD driver of claim 16, wherein the dropping comparing circuit comprises:

a dropping comparator which has a negative input end connected to the first segment voltage, a positive input end connected to the second common division voltage, and an output end that turns on or off the common dropping circuit;

a dropping adjustable resistance which is connected between an output end of the common dropping circuit and the positive input end of the dropping comparator; and

a dropping resistance which is connected between the positive input end of the dropping comparator and the second segment voltage.

18. The STN LCD driver of claim 16, wherein the common dropping circuit includes a charge capacitor therein.

19. A super twist nematic (STN) liquid crystal display (LCD) driver which drives an STN LCD panel, the STN LCD driver comprising:

a reference voltage generating unit which generates a reference voltage in response to an external voltage;

a first segment voltage generating unit which receives the reference voltage in response to the external voltage and generates a first segment voltage driving a segment electrode of the STN LCD panel;

a second segment voltage generating unit which generates a second segment voltage by boosting the first segment voltage;

a first common voltage generating unit which drives a common electrode of the STN LCD panel in response to a second common voltage and the first segment voltage and generates a first common voltage having a voltage level that is N (where N is an integer) times the difference of the voltage level of the second common voltage from the voltage level of the first segment voltage; and

a second common voltage generating unit which drives a common electrode of the STN LCD panel in response to the external voltage, the ground voltage, and the first segment voltage and generates the second common voltage having a voltage level that is lower than the voltage level of the first segment voltage using a predetermined resistance ratio.

20. The STN LCD driver of claim 19, wherein the second segment voltage generating unit comprises a boosting circuit, which has a charge capacitor therein, and receives and boosts the first segment voltage.

5 21. The STN LCD driver of claim 19, wherein the second segment voltage generating unit further comprises a segment voltage comparing circuit which turns off the boosting circuit if the voltage level of a segment division voltage is higher than the voltage level of the first segment voltage and turns on the boosting circuit if the voltage level of the segment division voltage is lower than the voltage level of the first segment  
10 voltage,

wherein the voltage level of the segment division voltage is generated by dividing the voltage level of the segment voltage using a predetermined resistance ratio.

15 22. The STN LCD drive of claim 21, wherein the segment voltage comparing circuit comprises:

a segment voltage comparator which has a negative input end connected to the first segment voltage, a positive input end connected to the segment division voltage, and an output end that turns on or off the boosting circuit;

20 a first segment resistance which is connected between an output end of the boosting circuit and the positive input end of the segment voltage comparator; and

a second segment resistance which is connected between the positive input end of the segment voltage comparator and the ground voltage.

25 23. The STN LCD drive of claim 19, wherein the second common voltage generating unit comprises:

a common dropping circuit which generates the second common voltage in response to the external voltage and the ground voltage; and

30 a dropping comparing circuit which turns on the common dropping circuit if the voltage level of a common division voltage is higher than the voltage level of the first segment voltage and turns off the common dropping circuit if the voltage level of the common division voltage is lower than the voltage level of the first segment voltage,

wherein the voltage level of the common division voltage is generated by dividing the voltage level of the second common voltage using a predetermined resistance ratio.

24. The STN LCD driver of claim 23, wherein the dropping comparing circuit  
5 comprises:

a dropping comparator which has a negative input end connected to the first segment voltage, a positive input end connected to the common division voltage, and an output end that turns on or off the common dropping circuit;

10 a dropping adjustable resistance which is connected between an output end of the common dropping circuit and the positive input end of the dropping comparator; and

a dropping resistance which is connected between the positive input end of the dropping comparator and the second segment voltage.

25. The STN LCD driver of claim 23, wherein the common dropping circuit  
15 includes a charge capacitor therein.

26. The STN LCD driver of claim 19, wherein the first common voltage generating unit comprises a common boosting circuit which receives and boosts the second common voltage, and wherein the common boosting circuit includes a charge  
20 capacitor therein.

27. A super twist nematic (STN) liquid crystal display (LCD) driver which drives an STN LCD panel, the STN LCD driver comprising:

25 a reference voltage generating unit which generates a reference voltage in response to an external voltage;

a voltage boosting unit which generates a boosting voltage by boosting the external voltage;

30 a voltage control unit which generates a first segment voltage and a second segment voltage which drive a segment electrode of the STN LCD panel in response to the reference voltage and the boosting voltage;

a first common voltage generating unit which drives a common electrode of the STN LCD panel in response to a ground voltage and the second segment voltage and



generates a first common voltage having a voltage level that is  $M$  (where  $M$  is an integer) times the difference of the voltage level of the ground voltage from the voltage level of the second segment voltage; and

a second common voltage generating unit which drives a common electrode of the STN panel in response to the ground voltage and the second segment voltage and generates a second common voltage having a voltage level that is  $1/M$  (where  $M$  is an integer) times the difference of the voltage level of the ground voltage from the voltage level of the second segment voltage.

28. The STN LCD driver of claim 27 wherein the voltage boosting unit, the first common voltage generating unit, and the second common voltage generating unit each include a boosting circuit, the boosting circuit including a charge capacitor therein.

29. The STN LCD driver of claim 27 wherein the voltage level of the second segment voltage is double the voltage level of the first segment voltage.